
ENVIRONMENTAL Fact Sheet



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Iron Bacteria in Drinking Water

The presence of elevated levels of iron or manganese in wells often gives rise to the growth of an organism called **iron bacteria**. These organisms produce a filamentous deposit as they grow that is analogous to a snake shedding its skin. This material clogs filters, plumbing components and contributes to staining.

Types of Iron Bacteria

The name iron bacteria identifies a number of organisms that are categorized as autotrophic, meaning they derive their carbon from the carbon dioxide (CO₂) in the air, and their energy from consuming (oxidizing) dissolved iron or manganese. Iron bacteria are approximately 1-2 microns wide and 3-15 microns long. A micron is one millionth of a meter. The term iron bacteria is normally used to describe these organisms even if the majority of the dissolved mineral is manganese. The formal names for some of the members of this group include:

Sphaerilus	Clonothrix
Crenothrix	Leptothrix

Consumer Problems

The problems caused by iron bacteria include the development of an orange-brown slime on water fixtures and the clogging of water use devices, sometimes to an extreme. The clogs can buildup at the ends of faucets, in screens on laundry machines, on pump impellers, and on the inside of pipes and tanks. The material often builds on a surface over time, and then breaks off in a large, single mass causing a clog. These organisms can also cause taste and odor problems in the water as they live, reproduce and die.

Health Risk

These organisms make water unsightly and in a customer's mind, raise a question as to the water's purity. However, there is no health risk associated with iron bacteria. These bacteria are naturally occurring in the soil and will thrive when there is an adequate food (iron or manganese) supply.

There is no health concern regarding iron in drinking water. For manganese in drinking water the story is changing. Recently, EPA indicated that there may be a health concern with higher levels of manganese, and the New Hampshire Department Health and Human Services has adopted an interim health-based standard for manganese at 0.84 mg/L. Since the level at which staining begins is 0.05 mg/L, treatment to remove iron or manganese has almost always been installed at a level well below the manganese concentration where a health concern would be appropriate.

Origin of Iron Bacteria

Iron bacteria are naturally occurring organisms in the environment. They typically exist on the top of the ground in limited numbers because of a limited food supply. The most common origin for iron bacteria in wells is their entry during well drilling or pump installation. See fact sheets WD-WSEB-1-2 through 1-6 for proper well construction. To prevent introducing iron bacteria into the well, the drilling process and the installation of the submersible pump assembly must be kept scrupulously clean.

Laboratory Testing

The DES Laboratory charges \$10 each for an iron and manganese test. In general, laboratory testing for iron bacteria is not necessary. Iron bacteria can be easily recognized using the following assessment.

Choose a clear glass sample container. Let the water sample sit quietly until all discoloration has occurred and settled to the bottom of the container. Visually examine this bottom sediment. If the sediment appears rusty colored, like settled powder or flour, there are likely few, if any, iron bacteria in the water. If, on the other hand, the sediment has a fluffy 3-dimensional appearance (like strands of stained cotton fibers) then there is probably a substantial amount of iron bacteria present.

Well Treatment To Kill Iron Bacteria

Once introduced, iron bacteria are difficult to fully eradicate from a well. Chlorination is the best method to kill iron bacteria. A well can be disinfected and iron bacteria killed by adding chlorine. One gallon of 5.25% sodium hypochlorite (common store bleach) in 1,000 gallons of water will produce a strong disinfecting solution of 50 parts per million (ppm). If iron or manganese are present in a well, chlorination should be done immediately after well drilling and pump installation to prevent the organisms from becoming established. Repeat chlorination may be needed to address organisms that escaped initial chlorination.

Dug Well: The volume of water inside the casing of dug wells is shown below:

Volume in Dug Well (Gallons)				
Well Diameter	1'	2'	3'	4'
Water Depth				
2.5'	15	60	130	230
5'	30	120	260	460
10'	60	240	520	930
20'	120	470	1060	1880

Bedrock Well: The volume of water inside a bedrock well is 1.5 gallons per foot of wet hole.

The volume inside the well casing does not include the volume of water readily available in the rock fractures that normally surround a well. As a rough rule of thumb, we suggest doubling the calculated volume. Add the chlorine directly to the well. Mix by using a strong flow of water through a clean garden hose recirculated directly back into the well. It is difficult to rid a well of iron bacteria once the organism has become established. Iron bacteria can be kept under control by periodic disinfection of the well using chlorine.

Well Treatment To Remove Iron or Manganese

There are two common methods for removing elemental iron or manganese from water; water softening or oxidation/filtration. Where iron bacteria are present in the raw water, a sizeable prefilter will be needed if a water softener is to be installed. Where oxidation/filtration will be chosen, no pretreatment is necessary. See fact sheet WD-WSEB-3-7 for a discussion of iron and manganese removal.

FOR MORE INFORMATION

For further information concerning the layout of a water treatment system and its purchase, DES suggests reviewing the fact sheet entitled, "Considerations when Purchasing a Water Treatment System" WD-WSEB-2-5. For more information please call the DES Water Supply Engineering Bureau at 271-3139. We would appreciate hearing from you concerning improvements to this fact sheet and your experiences when treating iron bacteria. For an overall listing of water supply related fact sheets, please request fact sheet WD-WSEB-15-2. Drinking water fact sheets are available through the DES web site at: <http://www.des.nh.gov/WSEB/> then select: [fact sheets](#). Please check the DES internet site annually for updates of this document. 9/02